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ABSTRACT

The study involving 11 reading disabled and 9 normal elementary school children evaluated the relative efficacy of practice with feedback on accuracy and practice with feedback on both accuracy and response rate related to response speed on word reading performance. Ss were exposed to randomized blocks of 10 high frequency words and 20 words which appeared infrequently in elementary reading materials. The low frequency words were taught over a period of 2 weeks within lessons designed to incorporate principles such as distributed practice, reduced unit size, and training in varied contexts. The group of 30 words were photographed onto individual slides and projected onto a wall. Vocalization speeds for each child were recorded. In the practice only (P) condition, children were exposed to the words and received information about the accuracy of their responses. In the practice plus feedback (PPF) condition, Ss received information regarding their vocalization speed as well as accuracy. Findings indicated that disabled readers had significantly slower vocalization times for both high and low frequency words than did their normal peers. The normal readers evidenced relatively stable prformance across trials under both conditions, while disabled readers had a more rapidly decelerating curve under PPF than under P. Results demonstrated that informative feedback serves as a cue for successive trials and as a reinforcer for accurate and relatively speedy word recognition for reading disabled children. (Author)

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THE EFFECT OF PRACTICE VS. PRACTICE WITH INFORMATIVE FEEDBACK ON SIGHT WORD VOCALIZATION TIME FOR NORMAL AND DISABLED READERS

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Abstract

A study was designed to evaluate the relative efficacy of practice, paired with informative feedback related to response speed, on the word reading performance of reading disabled and normal elementary school children. Eleven reading disabled and 9 normal children were exposed to randomized blocks of 10 high frequency words (from the Dolch Basic Sight Vocabulary List) and 20 words which appeared infrequently in elementary reading materials (according to the American Heritage Word Frequency Book, 1971). The low frequency words were taught over a period of two weeks within lessons designed to incorporate principles such as distributed practice, reduced unit size, and training in varied contexts. The entire group of 30 words were photographed onto individual slides and projected onto a wall. Vocalization speeds for each child were recorded. In the practice-only (P) condition, children were exposed to the words and received information about the accuracy of their responses. In the practice-plus-feedback (PPF) condition, youngsters received information regarding their vocalization speed as well as accuracy. Findings indicated that disabled readers had significantly slower vocalization times for both high and low frequency words than did their normal peers. The normal readers evidenced relatively stable performance across trials under both conditions, while disabled readers had a more rapidly decelerating curve under PPF than under P alone. These results demonstrated that informative feedback serves as a cue for successive trials and as a reinforcer for accurate and relatively speedy word recognition for reading disabled youngsters.

The Effect of Practice vs. Practice with Informative Feedback on Sight Word Vocalization Time for Normal and Disabled Readers

Reading is composed of a number of component processes which may require an individual's limited attentional capabilities (LaBerge and Samuels, 1974). Since individuals may be able to attend to only one component, but process others which do not require attentional resources, it is crucial that they become "automatic" with certain basic components in order to read efficiently. If a reader's word recognition skills are automatic, then he or she can focus attention on syntactic or semantic information in order to gain meaning rather than focusing on each individual word.

There is research evidence to support the notion that poor readers are hindered by non-automatic word recognition skills. Decoding speed appears to differentiate between individuals who achieve adequately on reading comprehension tests from those who do not (Cromer, 1970; Golinkoff & Rosinski, 1975; Perfetti & Hoagaboam, 1975). Results of investigations using matching and scanning tasks with orthographic stimuli also indicate that children with poor reading achievement exhibit relatively slow response rates in comparison to their normal peers (Katz & Wicklund, 1971; Spring, 1971; Steinhauser & Guthrie, 1977). It has been suggested by Vellutino and his colleagues (Vellutino, Steger, & Kandel, 1972; Vellutino, Harding, Phillips, & Steger, 1975; Vellutino, Steger, Moyer, Harding, & Niles, 1977) and Shankweiler and Liberman (1976) that disabled readers may have particular difficulty coding the necessary

associations between visual stimuli and their phonological (verbal) counterparts.

The ability to respond automatically to material may well reflect a specific cognitive style. Broverman, Broverman, and Klaiber (1966) constructed an index of automatization, corrected for general ability level. An index of automatization related to performance on a coded addition task under massed practice but not under distributed practice. It is likely that "weak automatizers" (p. 421) are susceptible to fatigue effects during massed learning trials. Otto and Fredricks (1963) also found that poor readers were susceptible to fatigue effects, demonstrated by reactive inhibition, during massed learning trials on a printing task.

What type of practice would help poor readers become more automatic with the word recognition component of the reading process? It is possible that practice trials which included informative feedback related to response speed might enhance the performance of poor readers on word recognition tasks (LaBerge & Samuels, 1974). Snodgrass (1975) reported that reaction time can be reduced by supplying informative feedback to subjects. Such information about response speed, relative to a pre-established criterion, may serve as a powerful reinforcer which helps to maintain a high level of motivation.

The present study was designed to evaluate the relative efficacy of practice, paired with informative feedback, on the word reading performance of reading disabled and normal elementary school children.

Youngsters were trained to read two word lists to criterion and then were given additional practice trials on these words. On one list, children were given additional practice only. On a second list, children received informative feedback on their verbalization time for earlier trials. It was hypothesized that, while both practice-only and practice-plus-feedback would result in reduced vocalization time for both normal and disabled children, informative feedback would have a qualitatively different effect on the performance of disabled readers than on the performance of their normally achieving peers. Non-disabled youngsters were expected to perform similarly under both treatment conditions. Disabled readers were expected to profit more from the informative feedback condition than from the practice-only condition.

Method

Subjects

Twenty-two children, ranging in age from 8 to 13 years, were selected for the study. Eleven youngsters, with a mean age of 10 years, 8 months (SD = 19.3 months), a mean WISC Verbal IQ of 71 (SD = 9.9), and a mean WISC Performance IQ of 89 (SD = 5.3), constituted a random sample of disabled readers drawn from a remedial reading program at a child guidance clinic. Children qualified for the program on the basis of severe reading retardation (2-6 years below actual grade placement as measured by standardized, silent and oral reading tests) and evidence of normal intellectual functioning (a WISC Verbal or Performance IQ

score of 80 or higher). According to their files, these children also exhibited specific processing deficiencies in one or more of the following areas: blending, naming, visual or auditory discrimination, and memory. The youngsters were from Black or Hispanic, lower class families.

Eleven youngsters from a public school serving Black and Hispanic populations were selected randomly as a control group. Since two children were dropped from the study because of excessive absence, data from nine children, with a mean age of 10 years, 4 months (SD = 17.3 months), were included in the analyses. No IQ information was available on these children. However, the principal, reading teacher, and classroom teachers selected a pool of intellectually average youngsters with adequate reading achievement from which these nine youngsters were drawn. All children in the control group were reading either at grade level or up to one year above grade level, according to their performance on the New York State PEP test in reading.

Apparatus

Equipment included a carousel projector (Kodak, Model 750H), outfitted with a Lafayette lens and a reaction time clock (Standard Electric Time, Model S-1). Depression of a control button opened the lens shutter and activated the clock, which had an accuracy of 1/100th second. Release of the button closed the shutter and stopped the clock simultaneously.

Thirty words were photographed onto individual slides. Each word was printed in letters .13cm. in thickness and 1.16cm. in height. They were photographed at a distance of 18cm. (F Stop 8, shutter speed 1/15th second) on 2 x 2 inch slides with Kodak High Contrast Film 5069. These slides were projected onto a white wall at a distance of 270cm.

Materials

The 30 words used in the study appear in Table 1. Ten high frequency words were selected from the Dolch Basic Sight Vocabulary list. The remaining 20 words had been selected from the instructional materials used in the remedial reading program (Research Institute for the Study of Learning Disabilities, Note 1). While the 20 words were likely to be in an elementary school child's speaking vocabulary, they appeared infrequently in elementary reading materials (American Heritage Word Frequency Book, 1971).

Table 1

Lists of High and Low Frequency Words Used in the Investigation

High Frequency Words	Low Frequency Words	
	List 1	List 2
the	Albert	Barbara
she	Elisabeth	Bertha
big	ceiling	cashier
little	paint	blouse
mother	shoves	collar
house	mosquito	sweater
over	ruins	jacket
table	cough	sleeves
run	ladder	scarf
baby	mark	argue

Procedure

All children were pretested on the 20 low frequency words to be used in the investigation. Children were then taught 10 words per week over a period of two consecutive weeks. The sight word lessons were designed to incorporate principles such as distributed practice, reduced unit size, and training in varied contexts. Specifically, they were intended for disabled readers who require systematic instruction.

Children were taught in small groups on three days and posttested individually on the fourth day of each week. Directly after posttesting, vocalization time was recorded for three blocks of trials (10 words per block) on the high frequency words and five blocks of trials (10 words per block) on the words learned that week. The 80 timed trials took from 15-30 minutes for a child to complete.

The following instructions were read aloud before the timed trials began:

> I am going to show you some words on the wall. First, you will see words that you know very well. Then I will show you the words that you learned this week. You will see each word a number of times. I will say "ready" just before the word appears on the screen. Try to say each word quickly. Try not to say the word until you know what it is.

The experimenter and child were seated adjacent to the projector. On a typical trial, two seconds after the "ready" signal, the experimenter depressed the button on the control box, thus opening the lens shutter and activating the timer. Once the child produced an accurate vocalization of the word, the experimenter released the button closing the

shutter and stopping the timer. The child was allowed seven seconds to pronounce the word, after which the trial was terminated. Vocalization time was recorded to the nearest 1/100th second. Five seconds elapsed between trials.

Experimental Manipulation

Two experimental conditions were used in the study: practice-only (P) and practice-plus-feedback (PPF). In the P condition, children were exposed to the randomized word blocks and only received information about the accuracy of their responses. In the PPF condition, children received information regarding their vocalization speed as well as their accuracy. If vocalization time for a test word was faster than the time recorded for the preceding trial, the experimenter said, "That was faster than last time." If vocalization time was slower than that of the preceding trial, the experimenter said, "That was slower."

In order to control for the difficulty of the two word lists, approximately half of the subjects were assigned randomly first to the P condition and the other half to the PPF condition. A week elapsed between children's exposure to the P and the PPF conditions.

Results

Means and standard deviations were computed on vocalization times for high and low frequency words for the normal and disabled groups. Mean vocalization time for high frequency words was based on the last two trial blocks given on these words during the slide practice sessions. The average time for a high frequency word was 1.36 seconds (SD = .16) for the disabled group and 1.13 seconds (SD = .18) for the normal group. The observed difference between groups, while less than one-quarter of a second, was significant at the .01 level ($t^{(18)} = 2.88$).

The magnitude of difference in vocalization speed was greater on the low frequency words taken from the lessons. Table 2 gives means for the two groups on the five blocks of trials for the two experimental conditions. On the first blocks for both conditions, the disabled readers had a mean vocalization time which was approximately three times as long as that of the normal readers. By the fifth and final block, the disabled reader's time was still twice as great as the average time for the control group. All obtained t values (ranging from 4.27-6.60, 18 df) were significant at beyond the .01 level.

Table 2

Means and Standard Deviations on Vocalization Time (in seconds) for the Two Groups Under the Two Experimental Conditions

Group	Practice Trial Blocks					Practice Plus Feedback Trial Blocks				
	1	2	3	4	5	1	2	3	4	5
Disabled Readers (n = 11)	3.66 (1.20)	3.12 (1.30)	2.35 (.68)	2.27 (.47)	2.03 (.50)	3.52 (1.23)	2.27 (.92)	2.02 (.65)	2.20 (.92)	1.90 (.74)
Normal Readers (n = 9)	1.23 (.22)	1.14 (.14)	1.10 (.21)	1.11 (.17)	1.06 (.15)	1.37 (.29)	1.05 (.18)	.94 (.11)	.90 (.14)	.91 (.20)

Note: Numbers in parentheses are standard deviations.

In order to evaluate differences in performance, it is important to consider the relative skill levels of the two groups. An examination of pre- and posttest data on the normal and disabled samples revealed that the groups were not equivalent with respect to the number of words correct prior to or following instruction. While the normal children were able to read approximately 64% of the 20 sight words on the pretest ($\bar{X}$ = 12.78, SD = 2.91), the disabled readers knew virtually none of the words prior to training ($\bar{X}$ = .64, SD = 1.57). The normal sample demonstrated over 90% mastery on the two weekly posttests ($\bar{X}$ = 9.56, SD = .73 for List 1; $\bar{X}$ = 9.89, SD = .33 for List 2). In contrast, the disabled youngsters were able to read between 70-85% of the words on the posttests ($\bar{X}$ = 7.1, SD = 1.29 for List 1; $\bar{X}$ = 8.55, SD = 1.51 for List 2).

Since the normal and disabled readers had differing degrees of achievement on the word lists, it is perhaps more useful to analyze

intra- rather than intergroup differences. Figure 1 demonstrates a qualitative difference in the relative performance of the two groups across the five blocks of trials on the low frequency words. The normal readers had relatively stable performance across trials, averaging approximately one second per word under both conditions. The disabled readers, on the other hand, had a more rapidly decelerating curve under practice-plus-feedback than under practice alone. While both conditions yielded a decrease in vocalization time to approximately two seconds per word, the PPF condition yielded a response time of 2.27 seconds by Block Two, whereas the P condition did not reach this level until Block Four.

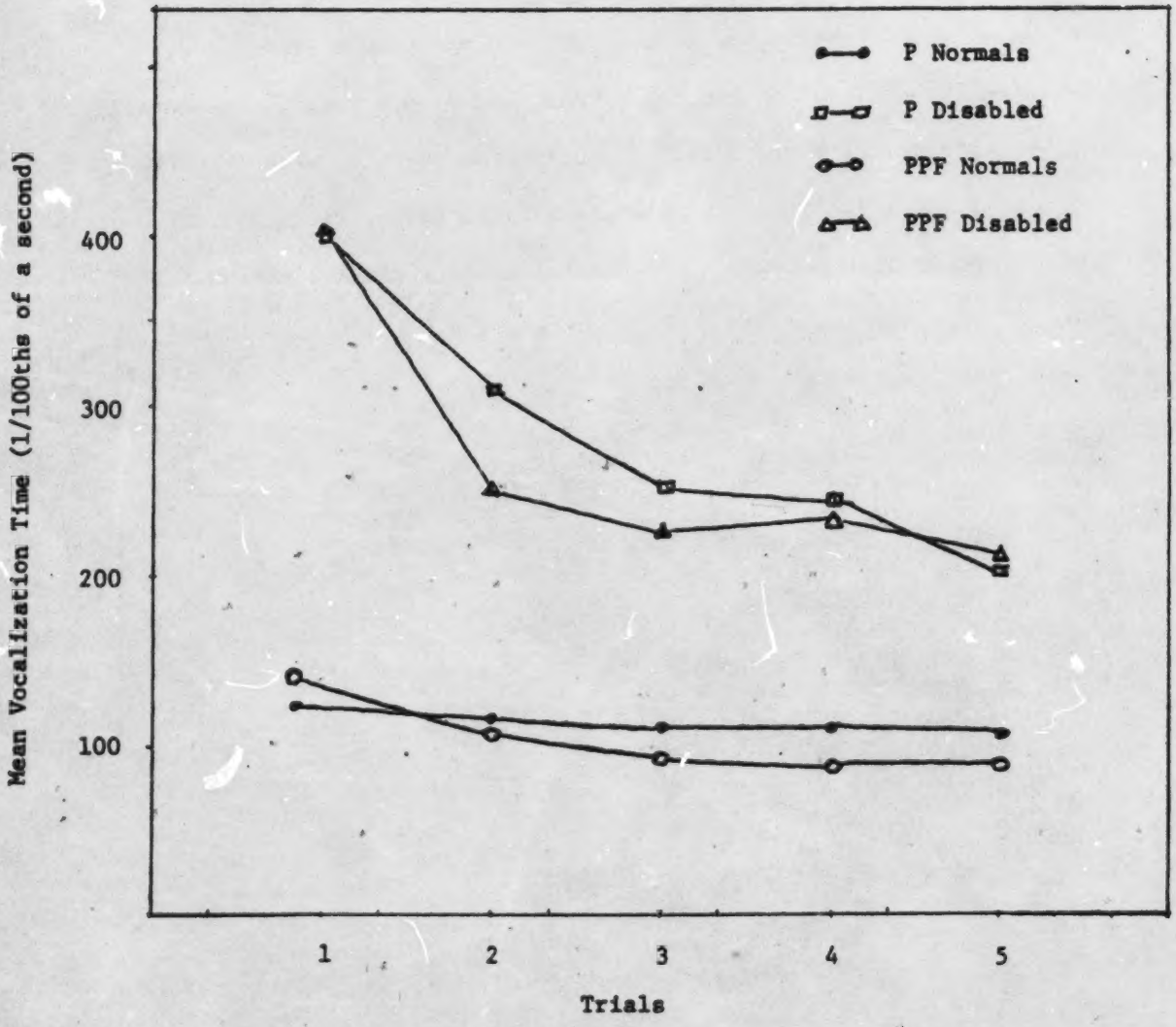

Figure 1--Mean Vocalization Time Over Five Experimental Trials for the Normal and Reading Disabled Subjects

Discussion

Results of the present investigation indicate that disabled readers have significantly slower vocalization times for low frequency words than do their normal peers. This finding has been supported by earlier investigations (Cromer, 1970; Golinkoff & Rosinski, 1975; Perfetti & Hoagaboam, 1975). It is interesting to note that the depressed speed for the disabled readers persists even when instruction is provided which focuses on mastery of the low frequency words. The fact that the poor readers were also slower on high frequency words than the normal sample supports the notion that word recognition difficulties may represent a generalized processing deficiency (Katz & Wicklund, 1971; Spring, 1971; Steinhauser & Guthrie, 1977).

It is important to note certain procedural problems which limit the extent to which one can generalize the findings from the present

study. First, the two groups did not begin instruction on the word lists with similar entry behaviors. Whereas the normal children were familiar with over half of the word sample, the disabled readers were unable to read more than 99% of the words. After the lessons, the two groups were still different with respect to accuracy on weekly posttests.

Secondly, the disabled youngsters were at a disadvantage because the procedure constituted a massed practice format. It is possible that these same youngsters, who might be categorized as "weak automatizers," would perform better with a distributed practice format (Broverman, Broverman, & Klailer, 1966).

It is perhaps more useful to look at the data in light of qualitative differences between groups. For the normal readers, vocalization speed remained fairly constant across extra practice trials, regardless of condition. The extra practice was unnecessary for this group. The disabled group, on the other hand, benefited from the additional practice trials. In addition, practice paired with informative feedback appeared to reduce the amount of practice needed to reach a relatively fast rate of response.

It would be useful to explore further the notion that a lack of automaticity may be a primary factor in reading disability. In addition, the differences in performance under the two treatment conditions for the disabled youngsters suggest that it is worthwhile to continue to examine the effect of informative feedback on response speed. The following adaptations should yield results which can be interpreted

with confidence: 1) Stimuli should be artificial or nonsense words so that all students begin at a zero baseline; and 2) A distributed practice format should be utilized to circumvent fatigue effects.

In summary, the present study indicates that youngsters with a history of reading difficulties have trouble developing automatic responses to words. Their verbalization rates for low and high frequency words are slower than those exhibited by their normal peers. Even after careful instruction on ten words per week, the disabled youngsters were two to three times slower than the normal youngsters. Findings also demonstrate that disabled youngsters gain more from additional practice trials than do their normal peers. When extra trials are paired with informative feedback, disabled youngsters are able to reduce their response speed by an average of 35% after only two practice trials per word. In comparison, practice alone required at least two additional trials to attain an equivalent degree of automaticity. Therefore, informative feedback serves as a useful cue for successive trials and as a powerful reinforcer for accurate and relatively speedy word recognition for youngsters with poor basic reading skills.

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